National 5 Mathematics

2018 Paper 2

Time allowed = 1 hr 50 mins Marks available = 60

For each question, you can scan the QR codes if using a paper copy or click on the links viewing this document electronically. This will allow you to view the worked solutions for each question. You can also either scan this QR Code or click on the link below to view this paper's marking scheme;

https://www.sqa.org.uk/pastpapers/papers/instructions/2018/mi_N5_Mathematics_all_2018.pdf

Remember to record your percentage for this paper in your analysis grid (your score ÷ 60 × 100).

FORMULAE LIST

The roots of $ax^2+bx+c=0$ are $x=\dfrac{-b\pm\sqrt{(b^2-4ac)}}{2a}$

Sine rule $\dfrac{a}{\sin A}=\dfrac{b}{\sin B}=\dfrac{c}{\sin C}$

Cosine rule $a^2=b^2+c^2-2bc\cos A$ or $\cos A=\dfrac{b^2+c^2-a^2}{2bc}$

Area of a triangle $A=\frac{1}{2}ab\sin C$

Volume of a sphere $V=\frac{4}{3}\pi r^3$

Volume of a cone $V=\frac{1}{3}\pi r^2 h$

Volume of a pyramid $V=\frac{1}{3}Ah$

Standard deviation $s=\sqrt{\dfrac{\Sigma(x-\bar{x})^2}{n-1}}$

or $s=\sqrt{\dfrac{\Sigma x^2-\dfrac{(\Sigma x)^2}{n}}{n-1}}$, where n is the sample size.

Total marks — 60

Attempt ALL questions

1. Households in a city produced a total of 125 000 tonnes of waste in 2017.

   The total amount of waste is expected to fall by 2% each year.

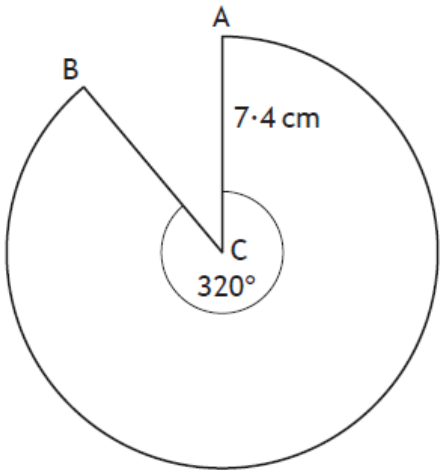
   Calculate the total amount of waste these households are expected to produce in 2020. 3

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/avomVowPSik

Video Lesson: APP 1·3a Bronze Outcome 3

2. The diagram below shows a sector of a circle, centre C.



   The radius of the circle is 7·4 centimetres.

   Calculate the length of the major arc AB. 3

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/Um32wcHssRA

Video Lesson: E+F 1·4b Bronze Outcome 1

3. Find $|\mathbf{r}|$, the magnitude of vector $\mathbf{r} = \begin{pmatrix} 24 \\ -12 \\ 8 \end{pmatrix}$. 2

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/prNMOyaz6yk

Video Lesson: APP 1·4 Silver Outcome 4

4. Solve, algebraically, the inequation

$$3x < 6(x-1) - 12.$$ 3

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/BmAUt_X9E2A

Video Lesson: REL 1·1c Silver Outcome 2

5. A farmers' market took place one weekend.

Stallholders were asked to record the number of customers who visited their stall.

The number of customers who visited six of the stalls on Saturday were as follows:

120 126 125 131 130 124

(a) Calculate the mean and standard deviation of the number of customers. 4

The mean number of customers who visited these six stalls on Sunday was 117 and the standard deviation was 6·2.

(b) Make two valid comments comparing the number of customers who visited these stalls on Saturday and Sunday. 2

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/AjPSzjiT1uY

Video Lesson: APP 1·4 Silver Outcome 2

6. A function is defined as $f(x) = 5 + 4x$.

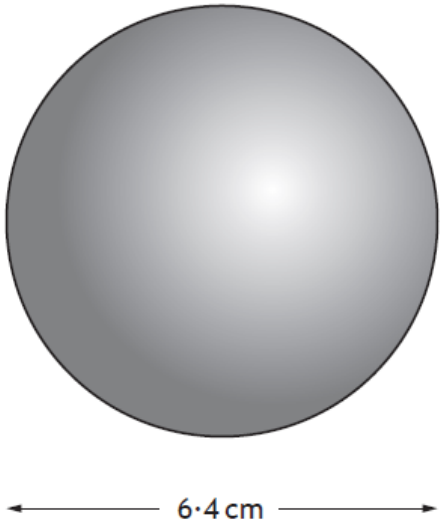
Given that $f(a) = 73$, calculate a. 2

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/CD7DR05t7lw

Video Lesson: REL 1·1b Bronze Outcome 2

7. A toy company makes juggling balls in the shape of a sphere with a diameter of 6·4 centimetres.



Calculate the volume of one juggling ball.
Give your answer correct to 2 significant figures. 3

Scan the QR code or click on it to view the worked solutions;

https://youtu.be/DSu7x9NK28w

Video Lesson: E+F 1·4c Silver Outcome 3

8. Solve the equation $7\sin x° + 2 = 3$, for $0 \leq x < 360$. 3

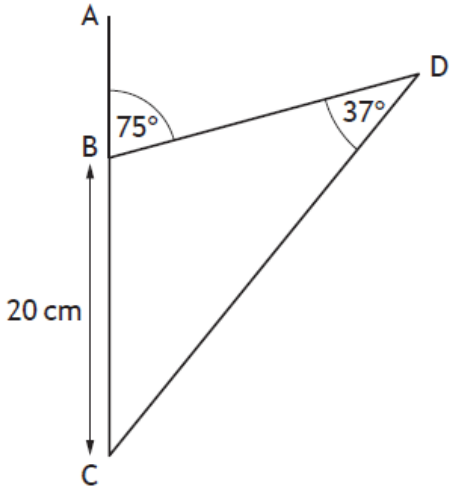
Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/mCjyB7rvg5g

Video Lesson: E+F 1·4c Silver Outcomes 1 and 3

9. In this diagram:

- angle ABD = 75°
- angle BDC = 37°
- BC = 20 centimetres.



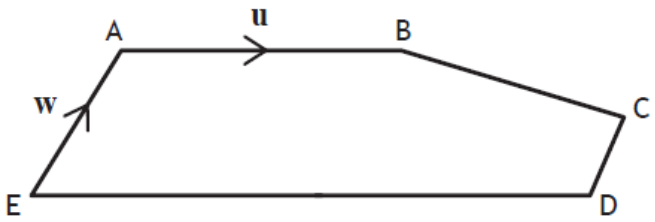
Calculate the length of DC. 3

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/lipDh3J5QzY

Video Lesson: APP 1·1 Silver Outcome 2

10. In the diagram below, $\overrightarrow{AB}$ and $\overrightarrow{EA}$ represent the vectors $\mathbf{u}$ and $\mathbf{w}$ respectively.



- $\overrightarrow{ED} = 2\overrightarrow{AB}$
- $\overrightarrow{EA} = 2\overrightarrow{DC}$

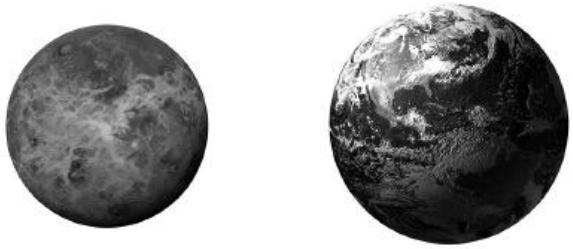
Express $\overrightarrow{BC}$ in terms of $\mathbf{u}$ and $\mathbf{w}$.
Give your answer in its simplest form. 2

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/N7Zh4WxhzKU

Video Lesson: APP 1·2 Gold Outcome 2

11. Venus and Earth are two planets within our solar system.



Venus Earth

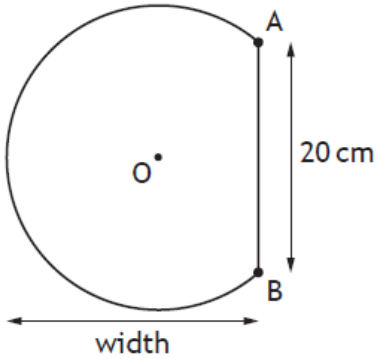
The volume of Venus is approximately $9{\cdot}3 \times 10^{11}$ cubic kilometres.
This is 85% of the volume of Earth.
Calculate the volume of Earth. 3

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/ILo0IsVWSM8

Video Lessons: APP 1·3a Silver Outcome 1 and E+F 1·1b Silver Outcome 3

12. The shape below is part of a circle, centre O.



The circle has radius 13 centimetres.
AB is a chord of length 20 centimetres.
Calculate the width of the shape. 4

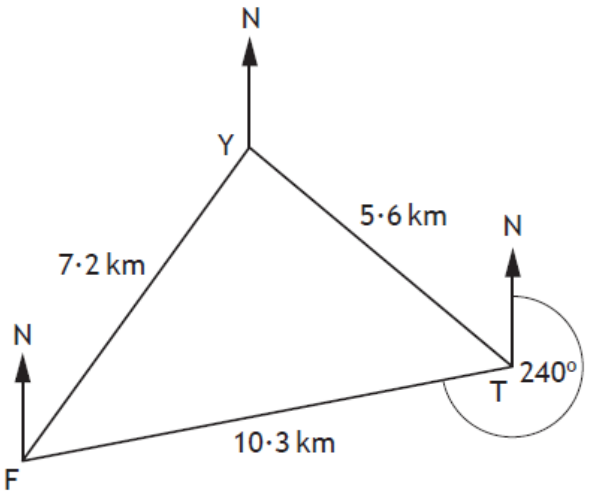
Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/82-Ae8Od8DE

Video Lesson: REL 1·4a Gold Outcome 1

13. A ferry and a trawler receive a request for help from a stranded yacht.

On the diagram the points F, T and Y show the positions of the ferry, the trawler and the yacht respectively.



- FY is 7·2 kilometres.
- TY is 5·6 kilometres.
- FT is 10·3 kilometres.
- F is on a bearing of 240° from T.

Calculate the bearing of the yacht from the trawler. 4

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/N-_rgC5o6Bs

Video Lesson: APP 1·1 Gold Outcome 3

14. A straight line has equation $2x - 5y = 20$.

Find the coordinates of the point where this line crosses the y-axis. 2

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/97EmIlaChz4

Video Lesson: REL 1·1a Gold Outcome 1

15. Express

$$\frac{n}{n^2-4} \div \frac{3}{n-2}, \quad n \neq -2, n \neq 2$$

as a single fraction in its simplest form. 3

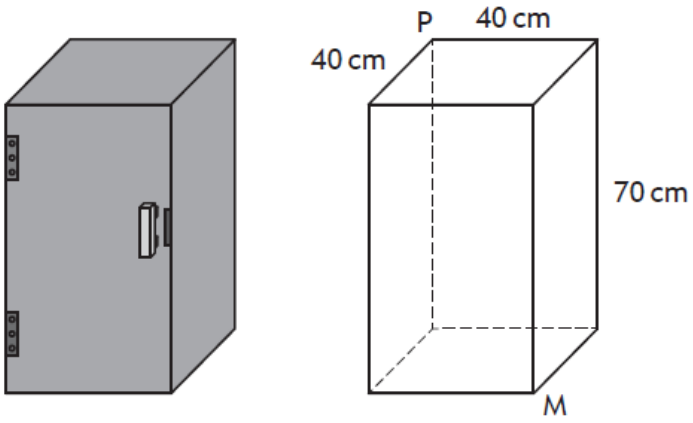
Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/KY99u9GNa90

Video Lessons: E+F 1·3 Gold Outcomes 1 and 3

16. Chris wants to store his umbrella in a locker.

The locker is a cuboid with internal dimensions of length 40 centimetres, breadth 40 centimetres and height 70 centimetres.



The umbrella is 85 centimetres long.

He thinks it will fit into the locker from corner P to corner M.

Is he correct?

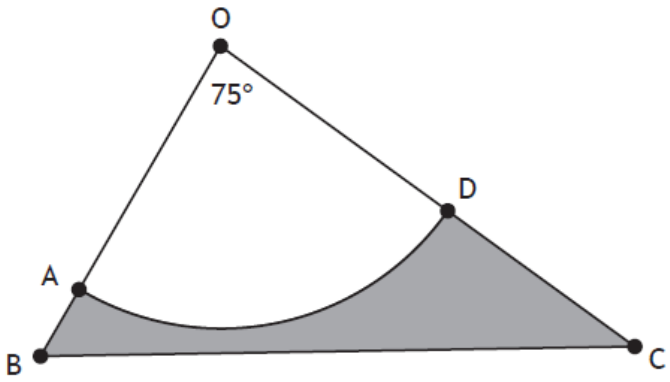
Justify your answer. 4

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/1davUVLv7Vs

Video Lesson: REL 1·4a Silver Outcome 1

17. In the diagram below AOD is a sector of a circle, with centre O, and BOC is a triangle.



In sector AOD:

- radius = 30 centimetres
- angle AOD = 75°.

In triangle OBC:

- OB = 38 centimetres
- OC = 55 centimetres.

Calculate the area of the shaded region, ABCD. 5

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/sb3dMpczl-I

Video Lessons: E+F 1·4b Bronze Outcome 2, APP 1·1 Bronze Outcome 1

18. A cinema sells popcorn in two different sized cartons.

The small carton is 16 centimetres deep and has a volume of 576 cubic centimetres.

The large carton is 24 centimetres deep and has a volume of 1125 cubic centimetres.

(a) Show that the two cartons are **not** mathematically similar. 3

The large carton is redesigned so that the two cartons are **now** mathematically similar.

The volume of the redesigned large carton is 1500 cubic centimetres.

(b) Calculate the depth of the redesigned large carton. 2

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/1fHAU5yD2-o

Video Lesson: REL 1·4c Gold Outcome 3

[END OF QUESTION PAPER]